Exhibit 2

Nitrogen Induced Hypoxia as a Form of Capital Punishment

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Executive Summary

At the request of Oklahoma State Representative Mike Christian, the authors of this study researched the question of whether hypoxia induced by nitrogen gas inhalation could serve as a viable alternative to the current methods of capital punishment authorized under Oklahoma law. As per the above, this study does not express an opinion on the wider question of whether Oklahoma should continue to administer capital punishment in general. The scope of this study is limited to the assumption that capital punishment will continue to be administered in Oklahoma, and given that assumption, analyzing whether hypoxia via nitrogen gas inhalation would be an effective and humane alternative to the current methods of capital punishment practiced in Oklahoma per the eighth amendment.

This study was conducted by reviewing the scientific, technical, and safety literature related to nitrogen inhalation.

The study found that:

1. An execution protocol that induced hypoxia via nitrogen inhalation would be a humane method to carry out a death sentence.
2. Death sentence protocols carried out using nitrogen inhalation would not require the assistance of licensed medical professionals.
3. Death sentences carried out by nitrogen inhalation would be simple to administer.
4. Nitrogen is readily available for purchase and sourcing would not pose a difficulty.
5. Death sentences carried out by nitrogen inhalation would not depend upon the cooperation of the offender being executed.
6. Use of nitrogen as a method of execution can assure a quick and painless death of the offender.

Accordingly, it is the recommendation of this study that hypoxia induced by the inhalation of nitrogen be offered as an alternative method of administering capital punishment in the State of Oklahoma.

The views expressed in this study are solely those of its authors and do not necessarily reflect those of the university at which we are employed.

Introduction

Nitrogen is an inert gas that at room temperature is colorless, odorless, and tasteless. It is the most common gas in the earth's atmosphere, comprising 78.09% of the air that humans breathe on a regular basis.

When combined with the normal 20.95% oxygen found in the atmosphere, nitrogen is completely safe for humans to inhale. However, an environment overly enriched in nitrogen will lack the appropriate level of oxygen necessary for human survival and will thus lead to hypoxia and rapid death. (U.S. Chemical Safety and Hazard Investigation Board, 2003, p.1).

Nitrogen hypoxia has been suggested as a means of administering capital punishment in the popular media on previous occasions. For example, in1995 the National Review featured an article by Stuart Creque titled *Killing With Kindness: Capital Punishment by Nitrogen Asphyxiation (1995)*. Creque's article was in response to a 9th Circuit U.S. District Court decision that California's gas chamber was an unconstitutionally cruel and unusual punishment. The article suggested nitrogen could provide a simple and painless alternative to the gas chamber that would require no elaborate medical procedures to administer.

The idea of administering capital punishment via nitrogen hypoxia resurfaced more recently in a Tom McNichol Slate magazine article titled *Death by Nitrogen (2014)*. The article was inspired by the stay of execution issued by the U.S. Supreme Court for a Missouri man facing execution via lethal injection. Again, the author suggested nitrogen induced hypoxia as a painless alternative to traditional methods of execution, adding that it offered the additional

benefits of requiring no medical training to administer and lacked any of the supply issues that exist with lethal injection.

The capital punishment protocols cited that utilize nitrogen to administer a death sentence do not actually rely on the nitrogen itself to bring about death. Nitrogen simply displaces the oxygen normally found in air and it is the resulting lack of oxygen which causes death. Without oxygen present, inhalation of only 1-2 breaths of pure nitrogen will cause a sudden loss of consciousness and, if no oxygen is provided, eventually death. (European Industrial Gases Association, 2009, p. 3).

Because nitrogen has not previously been used for capital punishment there is a lack scientific literature that specifically addresses its performance for that purpose; however, there have been medical experiments which involved subjects breathing pure nitrogen until they became unconscious. Beyond those experiments, most of the data related to nitrogen induced hypoxia comes from documented suicide in humans and research in high altitude pilot training.

Author's Note: in some cases the lay press will inadvertently refer to hypoxia as asphyxiation. This is technically inaccurate in this context, as asphyxia is the inability to breathe in oxygen ***and*** *the inability to respirate carbon dioxide. Hypoxia is the pathology related to the inability to intake oxygen even though one may still be able to exhale carbon dioxide. As will be seen later, the ability to exhale carbon dioxide is critical to the proposed method of execution, as it prevents the acidosis normally associated with asphyxiation.*

Medical Literature

The adult brain uses about 15 per cent of the heart's output of oxygenated blood (Graham, 1977, p.170). Hypoxia is the condition of having a lower-than-normal amount of

oxygen in the blood. Anoxia is an extreme form of hypoxia in which there is a complete absence of oxygen in the blood (Brierley, 1977 p.181). If the supply of oxygen in the blood is reduced below a critical level it will result in a rapid loss of consciousness and irreversible brain damage will occur (Graham, 1977, p.170).

A complete immediate global loss of oxygen to the brain, (a scenario in which no residual oxygen in the lungs or blood is delivered to the brain), will result in a loss of consciousness in eight to ten seconds, and a loss of any electrical output by the brain will occur a few seconds later. The heart may continue to beat for a few minutes even after the brain no longer functions (Brierley, 1977 p.182).

Ernsting (1961) performed a study on human volunteers that hyperventilated on pure nitrogen gas. The subjects performed the test multiple times, varying the length of time they inhaled the nitrogen. When the subjects inhaled nitrogen for eight-to-ten seconds they reported a dimming of vision. When the period was expanded to fifteen-to-sixteen seconds, the subjects reported some clouding of consciousness and impairment of vision. When the tests were expanded to seventeen-to-twenty seconds, the subjects lost consciousness. There was no reported physical discomfort associated with inhaling the pure nitrogen. (p. 295)

Unlike asphyxiation, hypoxia via the inhalation of nitrogen allows the body to expel the carbon dioxide buildup that is normally associated with the respiratory cycle. This helps prevent a condition known as hypercapnia - an accumulation of carbon dioxide in the blood. The result of this buildup of carbon dioxide is respiratory acidosis - a shifting of the ph levels in the blood to become more acidic. Some of the symptoms of respiratory acidosis are expected to be present

in cases of asphyxiation, but not expected to be present under pure hypoxia are anxiety and headaches, (Merrick Manuel, 2013).

Suicide Data

Perhaps one of the greatest testaments to both the humanity of nitrogen induced hypoxia as well as the ease of administration, is its rapid popularity as a self-selected means of suicide. Suicide by hypoxia using an inert gas is the most widely promoted method of human euthanasia by right-to-die advocates (Howard, M.O. et. al., 2011, P. 61).

The trend toward using an "exit bag" filled with an inert gas such as nitrogen or helium likely started with a publication of *Final Exit: The Practicalities of Self Deliverance and Assisted Suicide for the Dying*. The authors of the publication sought to identify methods of death that were swift, simple, painless, failure-proof, inexpensive, non-disfiguring and did not require a physician's assistance or prescription (Howard, M.O. et. al., 2011. p 61).

This method of suicide is indeed simple. It involves a clear plastic bag fitted over the head, two tanks filling the bag with helium via vinyl tubing, and an elastic band at the bottom of the bag to prevent the bag from slipping off the head. The parts needed to create the bag are inexpensive and available locally without prescription (Howard, M.O. et. al., 2011. p 61-62).

Reports of deaths observed via this method suggest that it is painless. Jim Chastain, Ph.D. President of the Final Exit Network of Florida described the process this way:

> In the several events I have observed the person breathes the odorless, tasteless helium deeply about three or four times and then is unconscious, no gagging or gasping. Death follows in 4-5 minutes. A peaceful process.

Derek Humphrey, current chair of the Final Exit advisory board is quoted as saying:

> In the approximate 300 cases which have been reported to me there has never been mention of choking or gagging. When I witnessed the helium death of a friend of mine it could not have been more peaceful (Final Exit, 2010).

However, it should be noted that deviations from the above protocols have not always been as successful. When masks were placed over the face (instead of using bags of helium over the head) it has been reported some problems have occurred. This is typically a result of the mask not sealing tightly to the face, resulting in a small amount of oxygen being inhaled by the individual. This extends the time to become unconscious and extends the time to death. This may result in purposeless movements by the decedent (Ogden et al, 2010. p 174-179). Further study will be necessary to determine the best delivery system for the state of Oklahoma.

Research on High Altitude Pilot Training

A great deal of research of the effects of hypoxia on human beings comes from aerospace medicine. Pilots that fly at high altitudes are subject to becoming hypoxic if their cabins lose air pressure. Altitude hypoxia has similar effects as the hypoxia one gets from breathing inert gases although it is caused by the inability of the lungs to absorb the oxygen in the air rather than a lack of oxygen in the air.

The Federal Aviation Administration (2003, p. 11) states:

> Hypoxia is a lack of sufficient oxygen in the body cells or tissues caused by an inadequate supply of oxygen, inadequate transportation of oxygen, or inability of the body tissues to use oxygen. A common misconception among many pilots who are inexperienced in high-altitude flight operations and who have not be exposed to physiological training is that it is possible to recognize the

> symptoms of hypoxia and to take corrective actions before becoming seriously impaired. While this concept may be appealing in theory, it is both misleading and dangerous for an untrained crew member. Symptoms of hypoxia vary from pilot to pilot, but one of the earliest effects of hypoxia is impairment of judgment. Other symptoms can include one or more of the following:
> (1) Behavioral Changes (e.g. a sense of euphoria).
> (2) Poor coordination.
> (3) Discoloration in the fingernails (cyanosis).
> (4) Sweating.
> (5) Increased breathing rate, headache, sleepiness, or fatigue
> (6) Loss or deterioration of vision
> (7) Light-headedness or dizzy sensations and listlessness.
> (8) Tingling or warm sensations.

Indeed, hypoxia has caused several airline accidents which are often fatal. The onset of hypoxia is typically so subtle that it is unnoticeable to the subject. The effects of hypoxia are often difficult to recognize. (Federal Aviation Administration, 2014, Ch. 8-1-2 (A) 5)

The attempts to train pilots to notice hypoxia are conducted using a hyperbaric chamber to simulate high altitudes. Often a trainee will be asked to remove his or her mask and perform simple tasks. At low levels of hypoxia, trainees typically feel little more than euphoria and a sense of confidence. At higher levels of hypoxia, trainees will quickly become unconscious. Time of useful consciousness at altitudes above 43,000 is 5 seconds (Federal Aviation Administration, 2003, p. 13).

Findings

Based on the review of the literature related to hypoxia induced by inert gases, this study makes the following findings:

1. An execution protocol that induced hypoxia via nitrogen inhalation would be a humane method to carry out a death sentence.
2. Death sentence protocols carried out using nitrogen inhalation would not require the assistance of licensed medical professionals.

3. Death sentences carried out by nitrogen inhalation would be simple to administer.
4. Nitrogen is readily available for purchase and sourcing would not pose a difficulty.
5. Death sentences carried out by nitrogen inhalation would not depend upon the cooperation of the offender being executed.
6. Use of nitrogen as a method of execution can assure a quick and painless death of the offender

Finding 1. An execution protocol that induced hypoxia via nitrogen inhalation would be a humane method to carry out a death sentence.

Rationale:

As an inert gas, nitrogen is odorless, colorless, tasteless and undetectable to human beings. It is 78% of the air we breathe on a daily basis, and thus there is little chance that any subject would have an unusual or allergic reaction to the gas itself.

Because the subject is able to expel carbon dioxide, the anxiety normally associated with acidosis in asphyxiation would not be present.

The literature indicates after breathing pure nitrogen, subjects will experience the following: within eight-to-ten seconds the subjects will experience a dimming of vision, at fifteen-to-sixteen seconds they will experience a clouding of consciousness, and at seventeen-to-twenty seconds they will lose consciousness. There is no evidence to indicate any substantial physical discomfort during this process.

After the subjects are unconscious, it should be expected some of the subjects will convulse. There is a possibility that subjects will feel euphoria prior to losing consciousness and a slight possibility they will feel a tingling or warm sensation. Most electrochemical brain activity should cease shortly after loss of consciousness, and the heart rate will begin to increase

to varying degrees until it stops beating 3 to 4 minutes later. Observed suicides involving inert gas hypoxia are described as peaceful, so long as caution is taken to eliminate the possibility of the subject inadvertently receiving supplemental oxygen during the process. Inert gas hypoxia is considered such a humane and dignified process to achieve death that it is recommended as a preferred method by right-to-die groups.

Finding 2. Death sentence protocols carried out using nitrogen inhalation would not require the assistance of licensed medical professionals.

Rationale:

The administration of a death sentence via nitrogen hypoxia does not require the use of a complex medical procedure or pharmaceutical products. The process itself, as demonstrated by those who seek euthanasia, requires little more than a hood sufficiently attached to the subject's head and a tank of inert gas to create a hypoxic atmosphere.

While a state execution would likely have a more elaborate mechanism to create hypoxia, nothing in the process would require specialized medical knowledge or the use of regulated pharmaceutical products. Accordingly, except for the pronouncement of death, the assistance of licensed medical professionals would not be required to execute this protocol.

Finding 3. Death sentences carried out by nitrogen inhalation would be simple to administer.

Rationale:

When considering a substitute method of capital punishment it is important to consider more than just what happens if everything goes according to protocol. The likelihood of mishaps must also be considered, as well as the consequences that would flow if those mishaps should occur.

Because the protocol involved in nitrogen induced hypoxia is so simple, mistakes are unlikely to occur. Oxygen and nitrogen monitors may be placed inside the contained environment to insure the proper mixes of gas are being expelled into the bag and inhaled by the subject.

However, the protocol should be careful to prevent the possibility of oxygen entering into the hood, as that can prolong time to unconsciousness and death, as well as increase the possibility of involuntary movements by the subject.

The risks to witnesses are minimal, as any potential leak of the nitrogen would not be harmful in a normally ventilated environment.

Finding 4. Nitrogen is readily available for purchase and sourcing would not pose a difficulty.

Rationale:

Nitrogen is utilized harmlessly in many fields within United States industry. Nitrogen is used in welding, hospital and medical facilities, cooking, and used in the preparation of liquid nitrogen cocktails. Nitrogen is used as a process to extend the life of food products such as potato

chips. The oxygen in a potato chip bag is displaced with nitrogen to reduce the spoilage of the chips as well as prevent the oil from becoming rancid. Nitrogen is used in doctor's offices to remove skin tags as well as other procedures. Nitrogen's cost is negligible and it is readily available.

Finding 5. Death sentences carried out by nitrogen inhalation would not depend upon the cooperation of the offender being executed.

Rationale:

Some forms of capital punishment require the offender to submit or comply to some degree in order to assure an efficient method of execution. With proper protocol and utilizing such devices as a restraint chair, nitrogen inhalation can be administered despite the presence of a non-compliant offender. The use of nitrogen can be used by non-medical personnel and a delivery system can be designed to ensure the execution is carried out without issue.

Conclusion

As per the above, it is the recommendation of this study that hypoxia induced by the inhalation of nitrogen be offered as an alternative method of administering capital punishment in the State of Oklahoma.

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